



# WEBENCH® Power Architect

## Project Report

Project : 4420283/4 : PA\_Project\_304 (modified from 301)  
 Created : 2015-07-07 21:51:19.544  
 Optimize project optFactor=3

### Project Summary

- |                                   |                       |
|-----------------------------------|-----------------------|
| 1. Total System Efficiency        | 81.23 %               |
| 2. Total System BOM Count         | 8.0                   |
| 3. Total System Footprint         | 117.0 mm <sup>2</sup> |
| 4. Total System BOM Cost          | \$1.76                |
| 5. Total System Power Dissipation | 381.3 mW              |

--> Launch WEBENCH Power Architect.

## Power Supplies

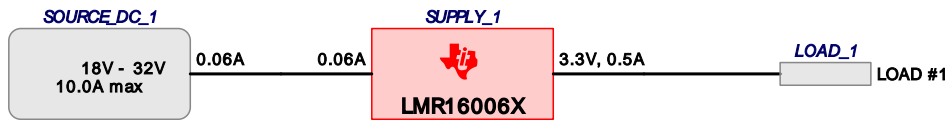
#	Name	NSID	Description	Vout	Iout	Efficiency	Foot-print	Cost	Design	Page
1.	SUPPLY_1	LMR16006X	Switcher : SIMPLE SWITCHER Wide Vin Buck Regulator	3.3 V	0.5 A	81.2%	117	\$1.76	8	4

## Power Loads

#	Name	VLoad	ILoad	Description
1.	LOAD #1	3.3 V	0.5 A	VoutRipple=10%

## Project Diagram

WEBENCH® Power Architect Project ID : 4\_PA\_Project\_304 (modified from 301) Power Architect 2015-07-07 21:51:19.544



## Electrical Procurement BOM

Manufacturer	Part Number	Description	Quantity	Budgetary Price	Footprint (mm <sup>2</sup> )
Kemet	C0805C104K5RACTU	0805	1	\$0.01	7
TDK	C3225X7R2A225K230AB	1210	1	\$0.19	15
Vishay-Dale	CRCW040228K0FKED	0402	1	\$0.01	3
Vishay-Dale	CRCW04028K45FKED	0402	1	\$0.01	3
MuRata	GRM21BR60J226ME39L	0805	1	\$0.05	7
Texas Instruments	LMR16006XDDCR	DDC0006A	1	\$1.20	10
NXP Semiconductor	PMEG6010CEH,115	SOD-123F	1	\$0.11	12
Bourns	SDR0604-330KL	SDR0604	1	\$0.18	61
Total			8	\$1.76	118

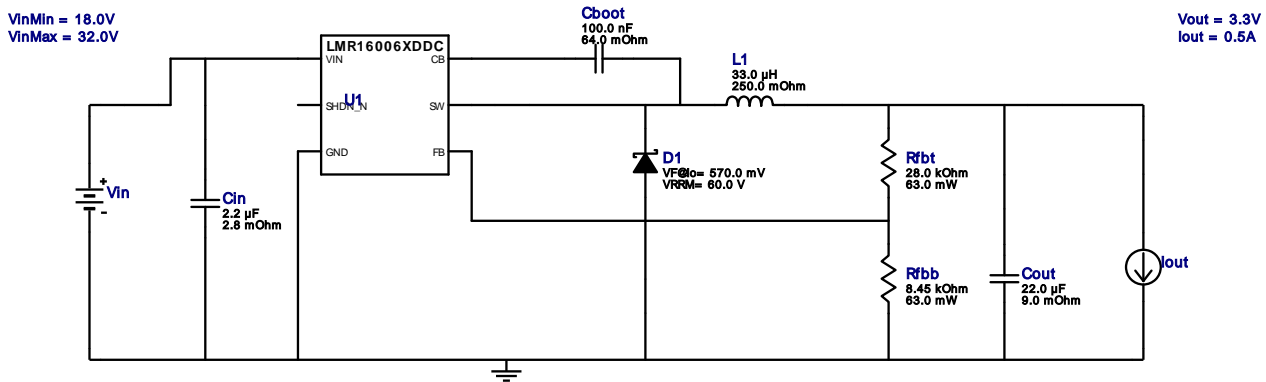


VinMin = 18.0V  
 VinMax = 32.0V  
 Vout = 3.3V  
 Iout = 0.5A









Device = LMR16006XDDCR  
 Topology = Buck  
 Created = 7/7/15 9:51:19 PM  
 BOM Cost = \$1.76  
 Footprint = 117.0 mm<sup>2</sup>  
 BOM Count = 8  
 Total Pd = 0.38W

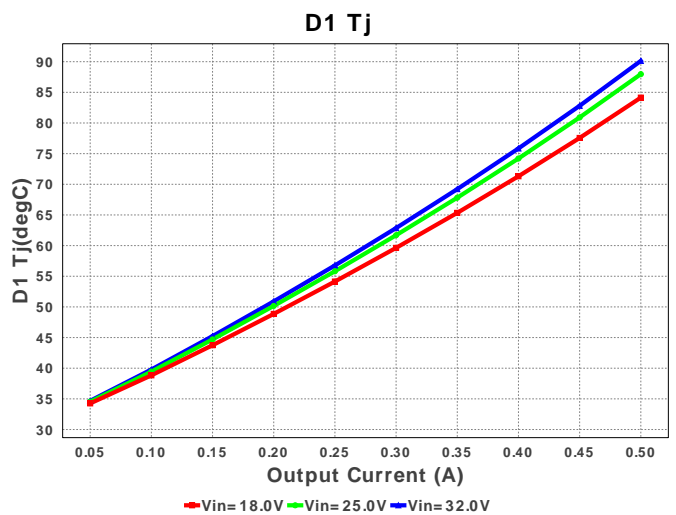
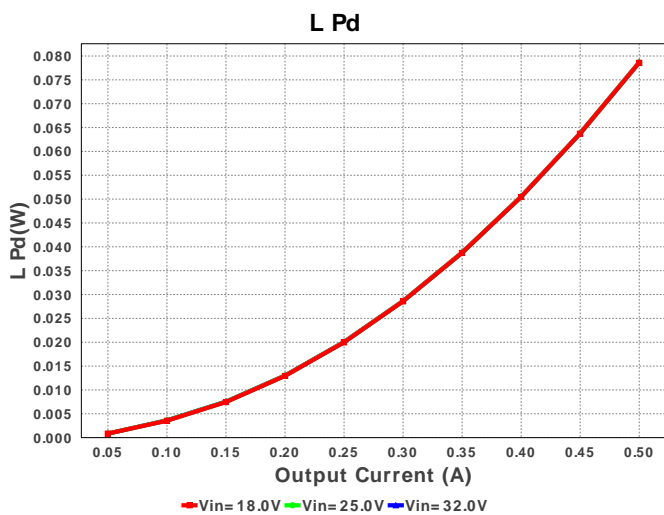
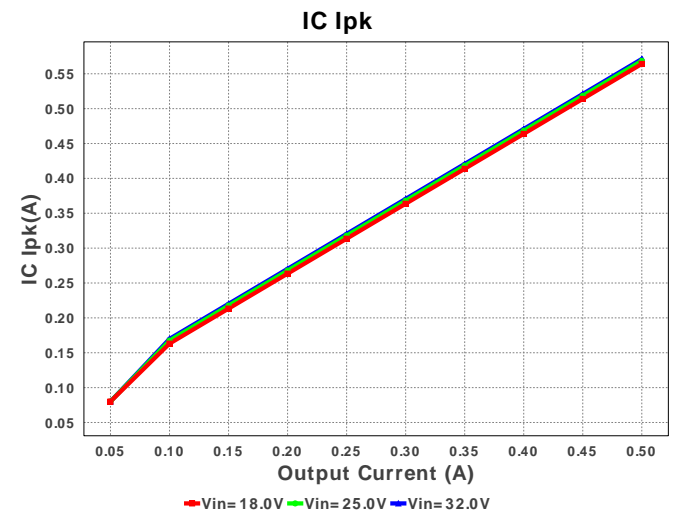
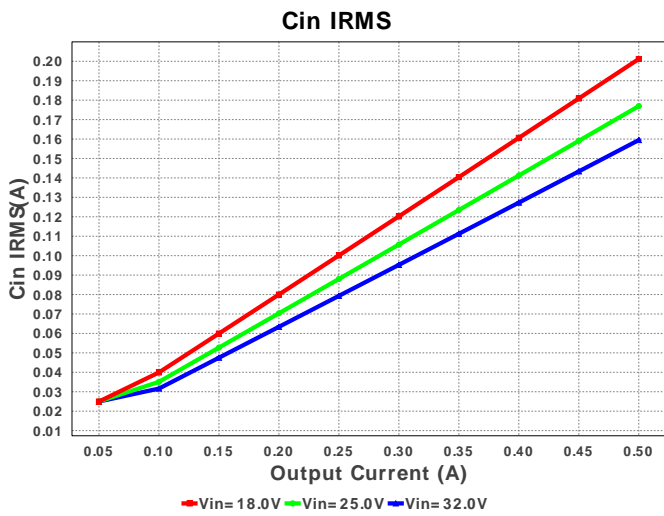
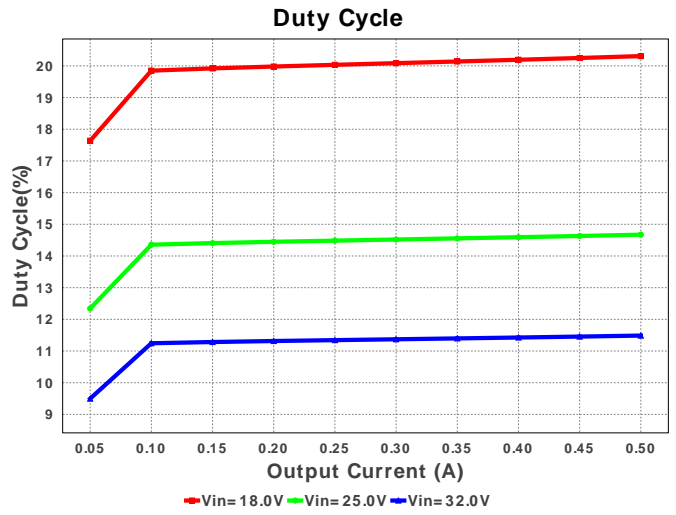
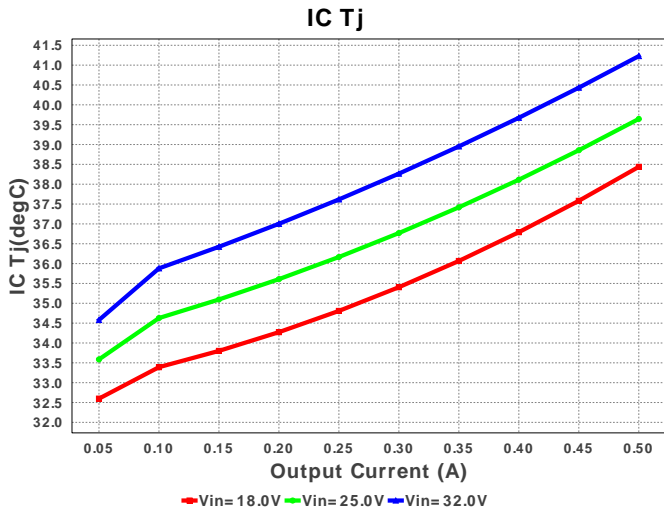
## WEBENCH® Design Report

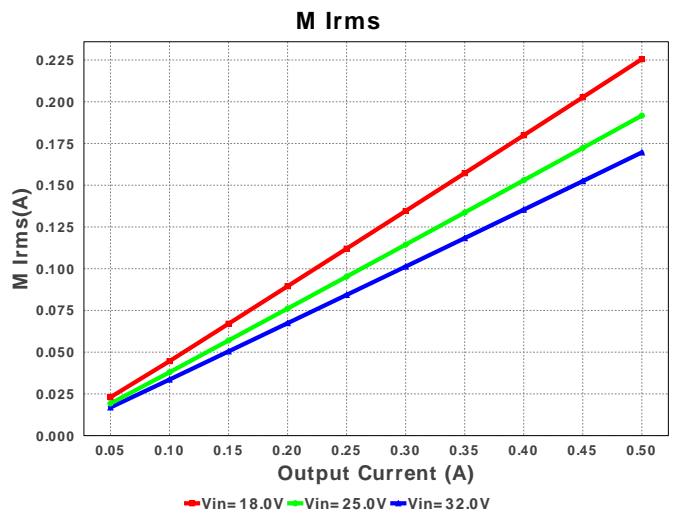
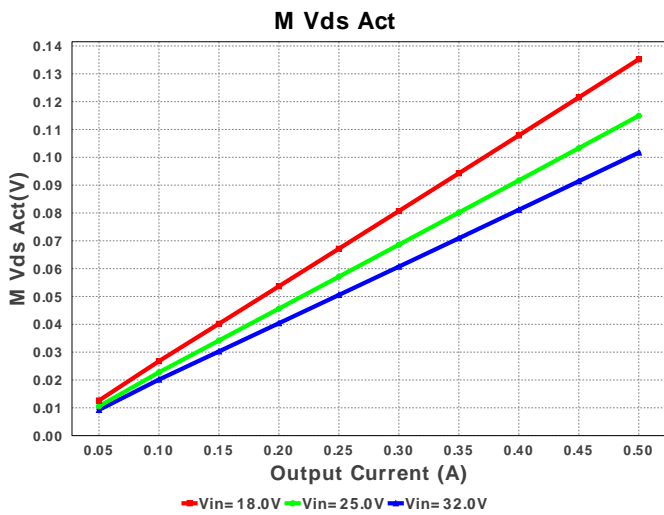
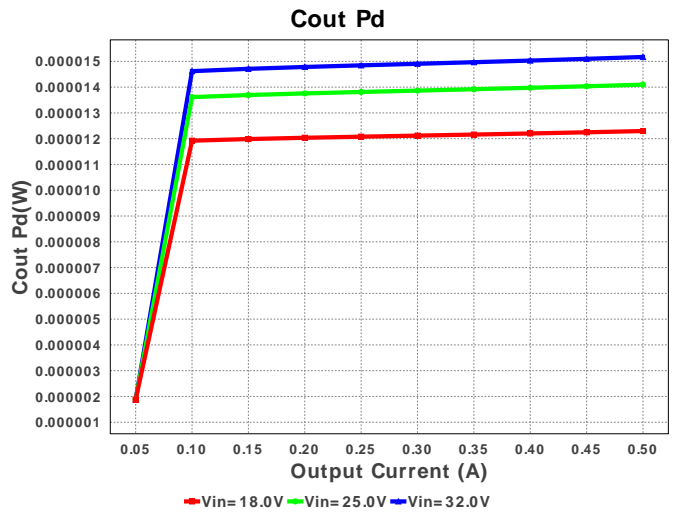
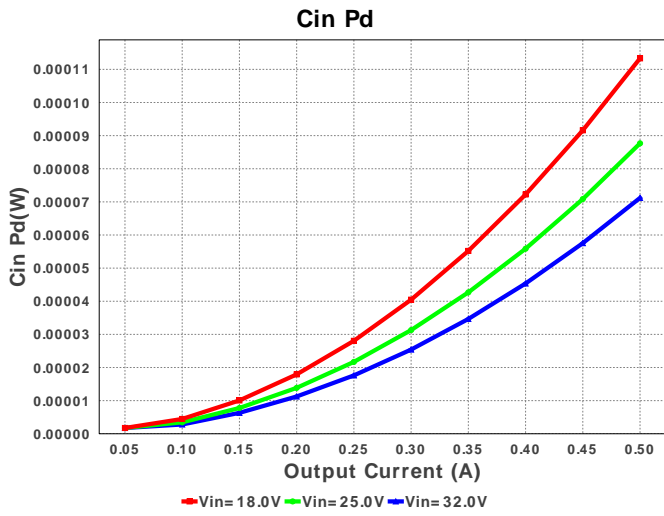
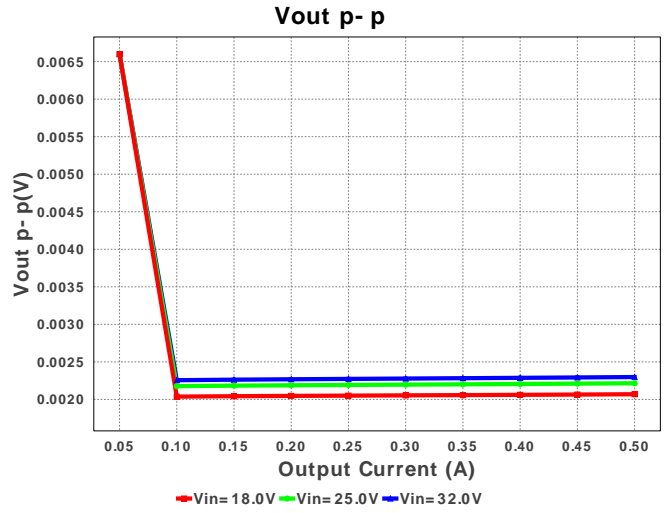
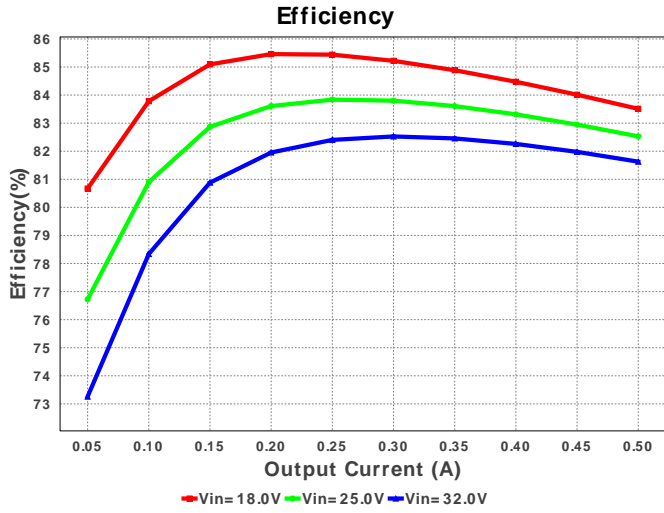
Design : 4420283/8 LMR16006XDDCR  
 LMR16006XDDCR 18.0V-32.0V to 3.30V @ 0.5A

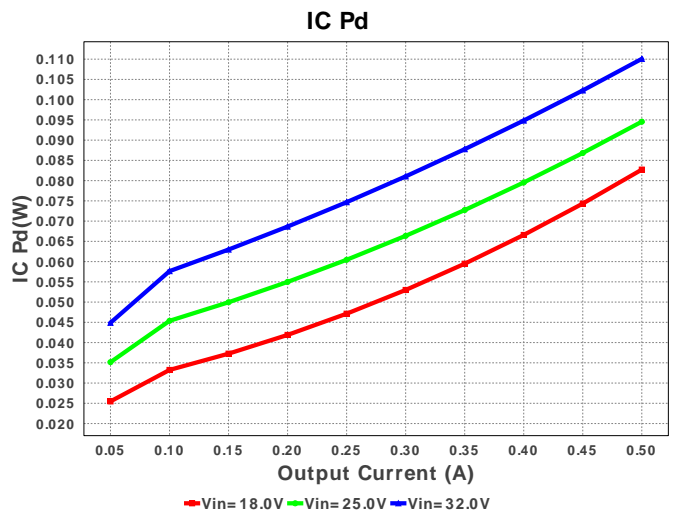
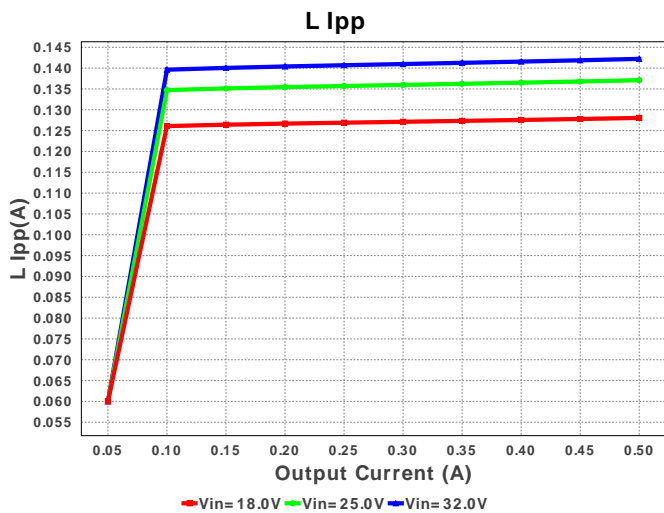
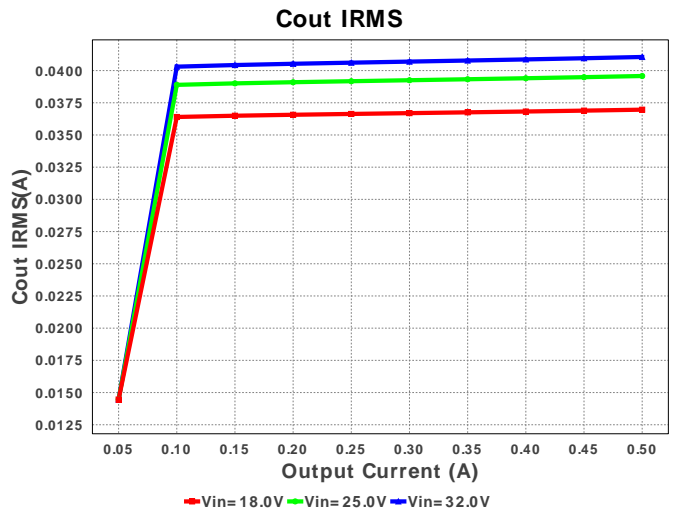
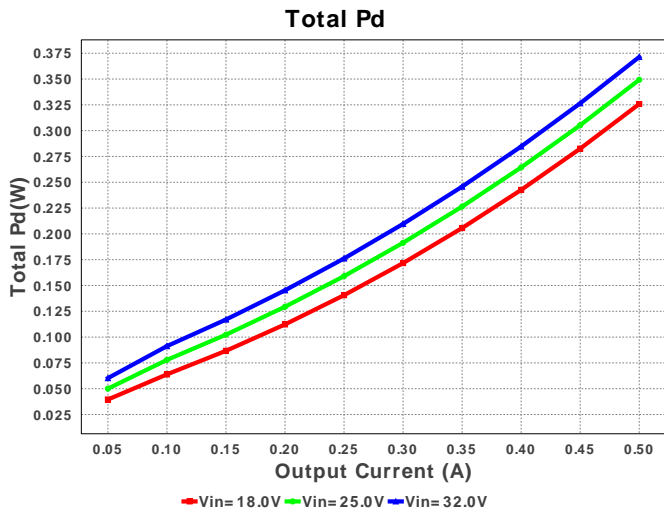
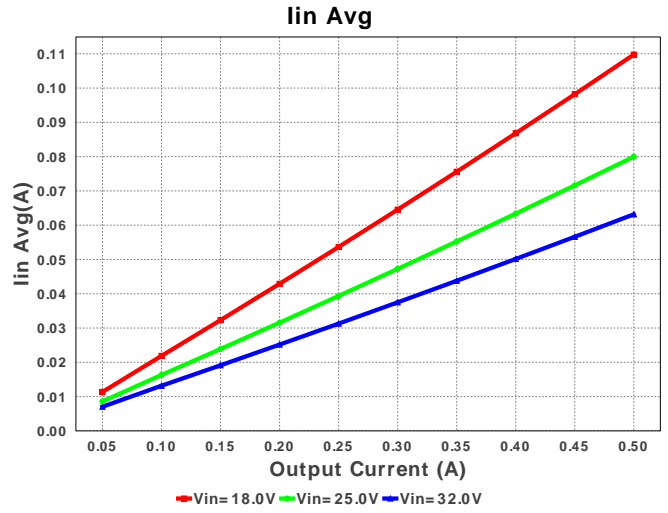
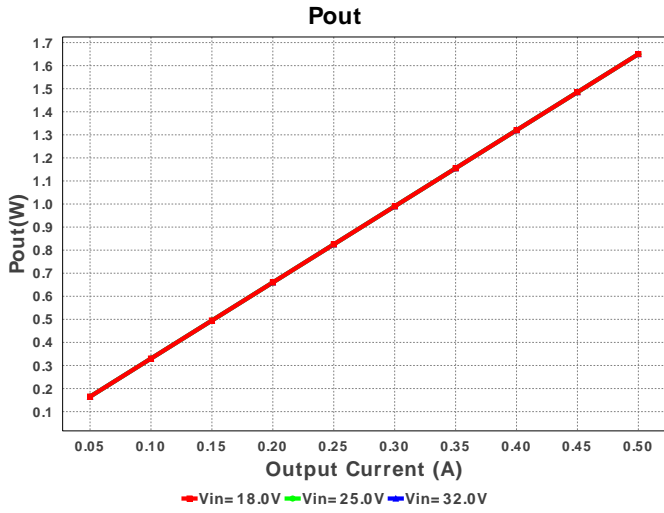


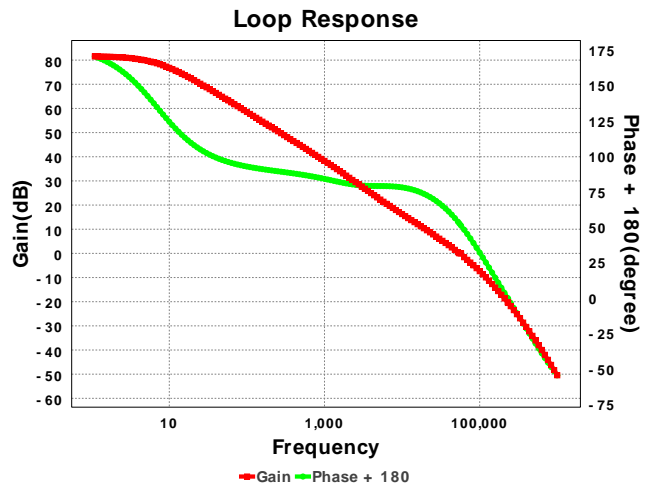
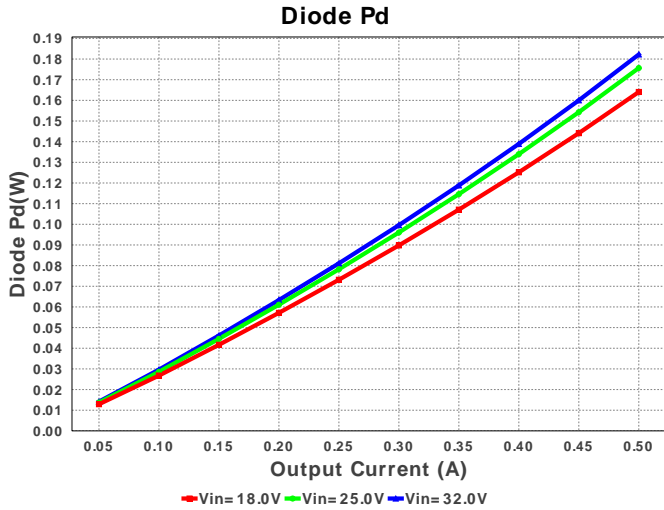
## Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cboot	Kemet	C0805C104K5RACTU Series= X7R	Cap= 100.0 nF ESR= 64.0 mOhm VDC= 50.0 V IRMS= 1.64 A	1	\$0.01	 0805 7 mm <sup>2</sup>
2.	Cin	TDK	C3225X7R2A225K230AB Series= X7R	Cap= 2.2 uF ESR= 2.8 mOhm VDC= 100.0 V IRMS= 9.8247 A	1	\$0.19	 1210 15 mm <sup>2</sup>
3.	Cout	MuRata	GRM21BR60J226ME39L Series= X5R	Cap= 22.0 uF ESR= 9.0 mOhm VDC= 6.3 V IRMS= 3.5 A	1	\$0.05	 0805 7 mm <sup>2</sup>
4.	D1	NXP Semiconductor	PMEG6010CEH,115	VF@Io= 570.0 mV VRRM= 60.0 V	1	\$0.11	 SOD-123F 12 mm <sup>2</sup>
5.	L1	Bourns	SDR0604-330KL	L= 33.0 uH DCR= 250.0 mOhm	1	\$0.18	 SDR0604 61 mm <sup>2</sup>
6.	Rfbb	Vishay-Dale	CRCW04028K45FKED Series= CRCW..e3	Res= 8.45 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
7.	Rfbt	Vishay-Dale	CRCW040228K0FKED Series= CRCW..e3	Res= 28.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	\$0.01	 0402 3 mm <sup>2</sup>
8.	U1	Texas Instruments	LMR16006XDDCR	Switcher	1	\$1.20	 DDC0006A 10 mm <sup>2</sup>









### Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	159.836 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	41.275 mA	Current	Output capacitor RMS ripple current
3.	IC Ipk	571.581 mA	Current	Peak switch current in IC
4.	Iin Avg	63.477 mA	Current	Average input current
5.	L Ipp	142.98 mA	Current	Peak-to-peak inductor ripple current
6.	M Irms	170.096 mA	Current	MOSFET RMS current
7.	BOM Count	8	General	Total Design BOM count
8.	FootPrint	117.0 mm <sup>2</sup>	General	Total Foot Print Area of BOM components
9.	Frequency	700.0 kHz	General	Switching frequency
10.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
11.	M Vds Act	101.971 mV	General	Voltage drop across the MosFET
12.	Pout	1.65 W	General	Total output power
13.	Total BOM	\$1.76	General	Total BOM Cost
14.	D1 Tj	93.367 degC	Op_Point	D1 junction temperature
15.	Vout OP	3.3 V	Op_Point	Operational Output Voltage
16.	Cross Freq	54.874 kHz	Op_point	Bode plot crossover frequency
17.	Duty Cycle	11.549 %	Op_point	Duty cycle
18.	Efficiency	81.23 %	Op_point	Steady state efficiency
19.	IC Tj	41.237 degC	Op_point	IC junction temperature
20.	ICThetaJA	102.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
21.	IOUT_OP	500.0 mA	Op_point	Iout operating point
22.	Phase Marg	53.084 deg	Op_point	Bode Plot Phase Margin
23.	VIN_OP	32.0 V	Op_point	Vin operating point
24.	Vout p-p	2.31 mV	Op_point	Peak-to-peak output ripple voltage
25.	Cin Pd	71.534 μW	Power	Input capacitor power dissipation
26.	Cout Pd	15.333 μW	Power	Output capacitor power dissipation
27.	Diode Pd	192.022 mW	Power	Diode power dissipation
28.	IC Pd	110.168 mW	Power	IC power dissipation
29.	L Pd	78.686 mW	Power	Inductor power dissipation
30.	Total Pd	381.268 mW	Power	Total Power Dissipation

### Design Inputs

#	Name	Value	Description
1.	Iout	500.0 m	Maximum Output Current
2.	Iout1	500.0 m	Output Current #1
3.	VinMax	32.0	Maximum input voltage
4.	VinMin	18.0	Minimum input voltage
5.	Vout	3.3	Output Voltage
6.	Vout1	3.3	Output Voltage #1
7.	base_pn	LMR16006X	Texas Instruments Base Part Number
8.	source	DC	Input Source Type
9.	ta	30.0	Ambient temperature

### Design Assistance

1. LMR16006X Product Folder : <http://www.ti.com/product/LMR16006> : contains the data sheet and other resources.



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